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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/049,689	09/05/2002	Frederic Gaillard	016301-029900US	4669

7590 07/01/2004

Patent Counsel, MS/2061  
Legal Affairs Dept.  
Applied Materials Inc.  
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Santa Clara, CA 95052

EXAMINER

SAGAR, KRIPA

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 07/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/049,689	GAILLARD ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Kripa Sagar	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 September 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>2/15/02</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Drawings*

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### *Claim Objections*

2. Claim 16 is objected to because of the following informalities: Typographic error.

Line 6 recites applying a BARC over said *polysilicon layer*. Fig.3B and the process steps suggest that the BARC is applied over the *nitride layer*. This is also conventional.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1-10,12-21,25,26 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat.5886391 to Niroomand et al.

Niroomand teaches the steps of the instant invention. In fig.2 a pad oxide 14 is formed over substrate 12; a polysilicon (poly) layer 14 is applied over the oxide and an

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anti-reflective coating (ARC) is deposited on the poly. The layers are patterned by a photoresist 22 and etched as shown in fig.5,6. The trench 32 has a trench bottom and sidewalls. [cl.1,4,16 ]The ARC is formed under the photoresist layer and is conventionally a BARC. [cl.2]. The ARC may be formed [cl.3,4,8,10,20] by CVD process (col.4;line.31-44). The thickness of the ARC [ cl. 6,18] is in the range 200-1000A. This is a function of the material of the ARC and the wavelength of the irradiation that is used for the exposure of the resist. The instant claimed range would be instantly available by optimization. The poly layer is less than 500 A which is within the claimed [cl.5, 17] range (4;21-24). Niroomand further processes the structure by removing the photoresist and filling [cl. 7,19] the trench (fig.6-8). The trench is filled [cl.8,20] with a dielectric 36 formed by a conventional ozone/precursor (ozone/ TEOS) process (13;65-14;29) to develop a substantially planar surface (fig.7). As shown by Niroomand this is a conventional and well known process wherein the ratios [cl.9,14,15] of the reactants, pressure and temperature may be adjusted to optimize the process times. The dielectric layer includes a porous [cl.10,21 ] barrier oxide layer (32) formed by oxidation. The dielectric layer and the porous layers are removed [cl.12,13,25,26] ] by (CMP) chemical mechanical polishing ( 14;18-22; fig.7). The limitations of claim 16 are taught (11;64-12;4) wherein a second polysilicon layer is applied over the nitride layer. The second poly layer is a BARC over which a photoresist is coated.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1,4,16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted Prior Art in view of US Pat. 5956584 to Wu et al.

Applicant admits that prior art teaches most of the steps of the instant claims (pp.1-3). Applicant states that the improvement to the prior art process comprises a poly layer on the pad oxide layer and under the ARC layer (p.4,I.22-29).

The use of poly / Si-nitride layer combination is common and routinely used in the art. Wu teaches forming a poly layer under a Si-nitride ARC (2;22-34).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polysilicon layer under the SiN layer as taught by Wu in the prior art process admitted by Applicant; because this is a well known process that is routinely used in the art. It has proven successful in lithographic patterning steps using ARCs. Wu teaches that the nitride ARC also acts a hard mask barrier thereby increasing the gate-oxide sheet resistance (2;65-67).

7. Claims 1,4,16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art in view of Niroomand.

Applicant admits that prior art teaches most of the steps of the instant claims (pp.1-3). Applicant states that the improvement to the prior art process comprises a poly layer on the pad oxide layer and under the ARC layer (p.4,I.22-29).

The use of poly / Si-nitride layer combination is common and routinely used in the art. Niroomand teaches forming a poly layer under a Si-nitride ARC as shown above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polysilicon layer under the SiN layer as taught by Niroomand in the prior art process admitted by Applicant; because this is a well known process that is routinely used in the art. It has proven successful in lithographic patterning steps using ARCs. Niroomand further teaches that the combined ARC performs better than the single layer nitride ARC (2;40-41 & 3;60-4;8).

8. Claims 11,22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Niroomand in view of US Pat. 5949126 to Dawson et al.

The teachings of Niroomand have been discussed above. It teaches forming thermal oxide layers in the trench. It does not explicitly teach the method of forming the oxides. The methods of forming such oxides [cl.11,22-24] are well known in the art and taught by Dawson. Dawson teaches forming thermal oxides in the temperature range 700-1100 deg.C in an oxygen ambient (6;3-32).

One of ordinary skill in the art would have been obviously motivated to form Niroomand's oxide layers by proven methods as taught by Dawson. This assures successful fabrication of reliable oxide layers in the trenches without oxidation of the nitride layer (6;3-32).

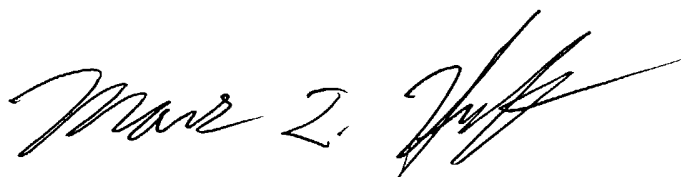
**Conclusion**

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 571-272-1392. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MH/ks

A handwritten signature in black ink, appearing to read "Mark F. Huff", with a stylized flourish at the end.

MARK F. HUFF  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700